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PATENT ABSTRACTS OF JAPAN

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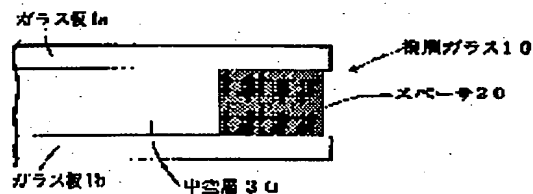
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(54) PLURAL-LAYER GLASS

(57)Abstract:

PROBLEM TO BE SOLVED: To eliminate the need for a secondary sealing material so as to reduce the cost in the plural-layer glass formed by opposing plural glass sheets with a spacer in between to form a hollow layer by forming the spacer from a specified thermoplastic resin composition.

SOLUTION: A spacer 20 is formed from a thermoplastic resin composition having 10-90 JIS A hardness at 25° C and 1×10^{-10} to 1×10^{-5} cm²/dyne creep compliance J (at 40° C and 5min after the measurement of shear mode is started). The composition is preferably allowed to contain ≥ 2 kinds of thermoplastic resins (e.g. partially cross-linked butyl rubber and high-density PE) one of which is the melt-fabricable rubber or elastomer and a desiccant (e.g. zeolite). Further, an inorg. filler (e.g. talc) is incorporated, as required, into the resin composition.



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CLAIMS

[Claim(s)]

[Claim 1] It is JIS [in / on the multiple glass with which it ****(ed) and opposite arrangement of the glass plate of two or more sheets was carried out through the spacer so that a hollow layer might be formed between them, and / in said spacer / 25 degrees C]. Multiple glass characterized by A degree of hardness consisting of a thermoplastics constituent of 10-90.

[Claim 2] Said spacer is multiple glass of claim 1 with which the creep compliance J which shows a creep property consists of a thermoplastics constituent which are below $1 \times 10^{-5} \text{ cm}^2 / \text{dyne}$ more than $1 \times 10^{-10} \text{ cm}^2 / \text{dyne}$ [after [of measurement initiation] 40 degrees C, shearing mode, and 5 minutes].

[Claim 3] Multiple glass of claims 1 or 2 which are the things containing at least two kinds of thermoplastics said whose thermoplastics constituents are the rubber which one side can thermofusion fabricate, or an elastomer, and a drying agent.

[Claim 4] Multiple glass of claims 1 or 2 with which said thermoplastics constituent consists of the following component.

The rubber in which thermofusion shaping is possible, or elastomer ... 10 - 80 % of the weight
Thermoplastics other than said rubber or an elastomer ... 0 - 50 % of the weight
Tackifier ... 0 - 15 % of the weight
A drying agent and additive ... 10 - 60 % of the weight.

[Claim 5] Multiple glass of claims 1 or 2 whose rates of 50 - 98 % of the weight and crystalline polyolefine the rate of butyl system rubber of as opposed to [including butyl system rubber and crystalline polyolefine] both total quantity in said thermoplastics constituent is 2 - 50 % of the weight.

[Claim 6] Multiple glass of claims 1 or 2 whose rates of the inorganic filler to a total of 100 weight sections of butyl system rubber and crystalline polyolefine the rate of 50 - 98 % of the weight and crystalline polyolefine is [the rate of butyl system rubber of as opposed to /, including butyl system rubber, crystalline polyolefine, and an inorganic filler / the total quantity of butyl system rubber and crystalline polyolefine in said thermoplastics constituent] 2 - 50 % of the weight, and are below the 200 weight sections.

[Claim 7] Multiple glass of claims 5 or 6 with which crystalline polyolefine consists of one or more sorts of polymers chosen from polyethylene, polypropylene, or those denaturation objects.

[Claim 8] the steam transmission coefficient of thermoplastics other than said rubber or an elastomer, or the steam transmission coefficient of crystalline polyolefine -- 3000 -- one multiple glass of claims 4-7 which are below $1 \times 10^{-13} \text{ cm}^3, \text{ cm/cm}^2, \text{ and sec-Pa}$.

[Claim 9] the rubber, the steam transmission coefficient of an elastomer, or the steam transmission coefficient of butyl system rubber in which said thermofusion shaping is possible -- 3000 -- one multiple glass of claims 3-8 which are below $1 \times 10^{-13} \text{ cm}^3, \text{ cm/cm}^2, \text{ and sec-Pa}$.

[Claim 10] the steam transmission coefficient of said thermoplastics constituent -- 5000 -- one multiple glass of claims 1-9 which are below $1 \times 10^{-13} \text{ cm}^3, \text{ cm/cm}^2, \text{ and sec-Pa}$.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the multiple glass which used the spacer made of resin.

[0002]

[Description of the Prior Art] In recent years, multiple glass is goods which it is observed from a viewpoint of energy saving and the need is continuing increasing. Since many processes are required for the manufacture, compared with the usual glass plate, cost is high, and the further low cost-ization is desired.

[0003] As shown in drawing 4, many of present multiple glass makes the glass plates 1a and 1b of at least two sheets counter through a spacer 2, and it comes to form a hollow layer among glass plates 1a and 1b. And it has come to seal the opening (crevice) which intercepted the hollow layer from the open air and consisted of the insides and spacer peripheral faces of the periphery section of those glass plates that have countered in the two-stage-sealing material of the room-temperature-setting mold represented with a polysulfide system or a silicone system by making the one-stage-sealing material 3 intervene between glass plates 1a and 1b and a spacer 2.

[0004] In the production process of multiple glass, the productivity amelioration by various simplification or automation, as a result a cost cut, etc. have so far been considered and proposed. For example, an aluminum spacer is bent, it is made a method or making the method of application of a room-temperature-setting mold sealant automate is raised. Moreover, the approach using the resin which scoured the drying agent instead of the aluminum spacer as shown in drawing 5 as a spacer 4 has also been proposed.

[0005] However, in the multiple glass using such a room-temperature-setting mold sealant, the class of spacer used is not asked but care of health of long duration is needed after multiple glass manufacture for hardening of a sealant. Therefore, care-of-health termination cannot ship a product.

[0006] Therefore, a care-of-health tooth space is provided in works, after keeping a certain fixed period product, it must ship, and time for delivery delays, and the request of a user could not necessarily be met. Moreover, in order to correspond to the need which will increase in the future, to avoid this since the care-of-health tooth space more than the former is needed and to secure the amount of supply of sufficient multiple glass, compaction of the above-mentioned care-of-health time amount is considered to be the need.

[0007]

[Problem(s) to be Solved by the Invention] From the point of low-cost-izing of multiple glass, the method of manufacturing multiple glass, without using two-stage-sealing material is proposed, using as a spacer the moldings which consists of resin which scoured the drying agent (JP,61-20501,B). However, maintenance of the configuration as multiple glass was [the spacer independent which degrees of hardness run short as a spacer, and consists of the above-mentioned resin in fact] difficult for this resin for spacers.

[0008] Moreover, JIS which scoured the drying agent to thermoplastics, such as the rigid resin in

which extrusion molding is possible, for example, vinyl chloride resin, and hot melt butyl. Multiple glass using the ingredient which has the hardness of the A degree of hardness 95 as a spacer is known (JP,7-17748,A). However, this JIS When the ingredient which has the hardness of the A degree of hardness 95 is used as the spacer or sealant of multiple glass, the stress concerning the seal section or the glass plate of multiple glass is large, and there are difficulties, like the glass crack of exfoliation of the seal section or multiple glass itself arises. Therefore, the multiple glass which is satisfied only with the spacer demanded as multiple glass of all properties, such as a life, configuration maintenance nature, and a moldability, is not known for the present condition, without using two-stage-sealing material.

[0009] By the way, as JP,7-17748,A also has instantiation of hot melt butyl, butyl system rubber is used as sealants, such as a building-materials application, from the field of the adhesiveness, high weatherability, and low moisture permeability. However, depending on a use application, since a degree of hardness is low and there is cold flow nature, if independent in respect of endurance over a long period of time, there is a problem. Moreover, since melt viscosity is high, the problem of being bad also has workability. In order to raise a degree of hardness, there is also the approach of mixing various fillers, but if only addition of a filler performs high degree-of-hardness-ization, since tensile strength and tear reinforcement fall depending on the case in addition to melt viscosity going up and spoiling workability remarkably, it is not desirable.

[0010] Namely, butyl system rubber carries out the seal of the field between a glass plate and a spacer, and since it has the function to maintain airtightness, it can use it suitably as an edge sealant of multiple glass. In this case, metal spacers, such as a product made from aluminum, will usually be used from the degree of hardness of butyl system rubber being low, and butyl system rubber will be arranged as a sealant between a spacer and a glass plate. However, the production process of the need [of using a metal spacer as mentioned above] top multiple glass is complicated.

[0011] In this way, a metal spacer is not needed but development of the sealant which can simplify a production process more is desired. The multiple glass which is satisfied only with the spacer demanded as multiple glass of all properties, such as a life, configuration maintenance nature, and a moldability, is not known for the present condition, without using two stage sealing.

[0012] The purpose of this invention solves the problem of the care of health which requires the long duration after manufacture, and is to offer the multiple glass which can realize unprecedented high productivity.

[0013]

[Means for Solving the Problem] In the multiple glass with which it ****(ed) and opposite arrangement of this invention was carried out through the spacer so that the glass plate of two or more sheets might form a hollow layer between them, said spacer is set at 25 degrees C, and it is JIS. The multiple glass characterized by A degree of hardness consisting of a thermoplastics constituent of 10-90 is offered.

[0014]

[Embodiment of the Invention] Hereafter, with reference to a drawing, this invention is further explained to a detail. Drawing 1 is the partial outline sectional view showing an example of the configuration of the multiple glass of this invention, as for multiple glass 10, only with a spacer 20, it is held at predetermined interval and the hollow layer 30 becomes so that the glass plates 1a and 1b of two sheets may be formed in between. A spacer 20 is JIS. A degree of hardness is formed from the thermoplastics constituent of 10-90. In addition, the above semantics of "being based only on a spacer 20" shall point out making unnecessary the spacer made from a two-stage-sealing material metallurgy group etc. otherwise, and shall include priming applied if needed.

[0015] It sets at 25 degrees C and the thermoplastics constituent used for a spacer ingredient in the configuration of the multiple glass of this invention is JIS. A degree of hardness is the thermoplastics constituent of 10-90. As such a resin constituent for spacers, as long as it has the above-mentioned property, any thermoplastics constituent can be used.

[0016] In addition, it is various in recent years and is included by the thermoplastic elastomer

currently used and the "thermoplastics constituent" as used in the field of [as long as it adjusts a vulcanization consistency and the rubber system ingredient by heating which enabled it to carry out a melting flow also has the above-mentioned property] this invention. Furthermore, the compound which included the so-called plasticizers, such as dibutyl phthalate and G 2-ethylhexyl phthalate, in these thermoplastics constituent is also contained in the "thermoplastics constituent" as used in the field of this invention as long as it has the above-mentioned property.

[0017] As for the above-mentioned resin constituent used by this invention, it is desirable that either [at least] the rubber in which thermofusion shaping is possible, an elastomer, the above-mentioned rubber or thermoplastics other than an elastomer is included, and, specifically, it is more desirable that both are included. Moreover, as for the above-mentioned resin constituent, it is desirable to consist of rubber of low moisture permeability, an elastomer, or thermoplastics. Furthermore, when multiple glass is constituted, in order to prevent invasion of the moisture to the hollow layer of multiple glass, it is desirable that it is the resin constituent with which the drying agent of the specified quantity was scoured.

[0018] as the above-mentioned rubber in which thermofusion shaping by low moisture permeability is possible or an above-mentioned elastomer -- the steam transmission coefficient -- desirable -- 3000 -- it is the rubber or the elastomer below $\times 10^{-13}$ cm³, cm/cm², and sec-Pa, and butyl system rubber, such as isobutylene isoprene rubber which consists of a copolymer which makes an isobutylene and an isoprene a subject especially, a polyisobutylene, and halogenation isobutylene isoprene rubber, is suitable. The rubber or the elastomer in which thermofusion shaping by such low moisture permeability is possible may be used with independent or two or more sorts of blends.

[0019] Moreover, as low moisture permeability thermoplastics other than the above-mentioned rubber or an elastomer, the copolymers or those denaturation objects of polyethylene, polypropylene, a vinylidene chloride, a polyvinyl chloride, etc. and the monomer that constitutes these polymers are mentioned, for example, and especially the polyethylene of high density is [crystalline polyolefine is desirable and] desirable. the steam transmission coefficient of these thermoplastics -- 3000 -- below $\times 10^{-13}$ cm³, cm/cm², and sec-Pa -- desirable -- 500 -- below $\times 10^{-13}$ cm³, cm/cm², and sec-Pa are still more desirable. Especially this thermoplastics is contributed to the configuration maintenance engine performance of a spacer.

[0020] In addition to thermoplastics of low moisture permeability other than the rubber or the elastomer in which thermofusion shaping by the above-mentioned low moisture permeability is possible, this rubber, or an elastomer, a drying agent is blended with the resin constituent for spacers in this invention, and the additive of an inorganic filler or others is further blended with it if needed. As a drying agent, each drying agent used for them by the conventional spacer and conventional sealant of multiple glass, mixing can use it, for example like a zeolite, an alumina, and silica gel.

[0021] Although such a resin constituent for spacers uses the above-mentioned component as a desirable component, it can use a tackifier, lubricant, a pigment, an antistatic agent, an antioxidant, a thermostabilizer, a filler, a foaming agent, etc. for the above-mentioned thermoplastics as an additive, blending them if needed.

[0022] This resin constituent for spacers kneads the above-mentioned component, and is prepared. JIS in 25 degrees C of the resin constituent obtained on the occasion of the preparation It is important to blend a need component so that A degree of hardness may become 90 or less. The reason made or less into 90 is as follows.

[0023] JIS It is JIS in order that a creep may hardly occur, when it is going to use the thermoplastics constituent with which A degree of hardness exceeds 90 as a spacer of multiple glass. When the durability test shown in R3209 is carried out, the stress by expansion of air is applied to the adhesion interface of a glass plate and a spacer under an elevated temperature. For this reason, if adhesive strength is inadequate, even when exfoliation occurs and adhesive strength is secured temporarily, glass may break. Although it is possible to obtain only the adhesive strength which bears the stress to which a hollow layer expands by applying an elevated temperature or high pressure also with the adhesives known now, since breakage of

glass occurs and productivity falls remarkably by applying elevated-temperature high pressure, the purpose of this invention aiming at manufacture cost reduction is not met.

[0024] JIS in 25 degrees C of a resin constituent on the other hand since a problem will arise to the configuration maintenance nature of multiple glass if a degree of hardness is too low It is important to blend a need component so that A degree of hardness may become ten or more. Furthermore, it is JIS. Even if A degree of hardness is ten or more, a plate gap may be caused

when a degree of hardness is comparatively small, and the thickness of a hollow layer is thick.

[0025] The thickness of the hollow layer of the multiple glass generally used is about 4-18mm (there is much what is 6mm or 12mm). Therefore, when a degree of hardness is comparatively small, even if a plate gap does not arise in that whose thickness of a hollow layer is 6mm, a plate gap may arise in a 12mm thing. Even if the thickness of a hollow layer is 12mm, it can avoid producing a plate gap by making the above-mentioned degree of hardness or more into 40. As for especially the JISA degree of hardness of a thermoplastics spacer, in the multiple glass in this invention from this, 40 or more are desirable.

[0026] JIS Multiple glass using the resin constituent with which A degree of hardness exceeds 90 as a spacer has the large stress concerning a glass plate. Therefore, JIS With any multiple glass using a glass plate with 5mm [in thickness specified by R3209], and a thickness of 3mm, a glass crack arises during an acceleration durability test.

[0027] On the other hand, JIS A degree of hardness does not generate a glass crack in the above-mentioned trial with the multiple glass for which multiple glass using the resin constituent of 90 as a spacer used the glass plate with a thickness of 5mm. On the other hand, the glass crack may have generated the multiple glass using a glass plate with a thickness of 3mm in the above-mentioned trial. Therefore, JIS of the resin constituent for spacers The upper limit of A degree of hardness is 90. Moreover, JIS In the above-mentioned trial, a glass crack is generated with neither of the multiple glass which, as for multiple glass using the resin constituent whose A degree of hardness is 75 as a spacer, used the glass plate with 5mm [in thickness], and a thickness of 3mm. Since thickness is 3mm, the glass plate for multiple glass generally used now is JIS of the resin constituent for spacers. The range of 40-75 is more suitable for A degree of hardness.

[0028] By the way, JIS The creep compliance J which shows a creep property shows the property of resin in case continuous stress is added to the convention by A degree of hardness being momentary, and it is expressed with the inverse number of an elastic modulus. This creep compliance J is measured as follows, for example.

[0029] Drawing 6 is the outline sectional view showing the measuring method of creep compliance J. The magnitude of the field pasted up on glass plates 61a and 61b is 10x50 (mm), and the resin ingredient 60 which should be measured is fabricated by the thickness of 12mm. And it is always 0.2kg/cm² to a resin ingredient. A glass plate is pulled in the direction of the arrow head of drawing in 40-degree C ambient temperature, and creep compliance J is calculated from the amount of elongation of the ingredient of 5 minutes after so that stress may be added. In addition, although it is not dependent on the thickness of glass plates 61a and 61b, suppose the value of J that a glass plate with a thickness of 5mm is used here.

[0030] For example, in the conveyance after the production, multiple glass adsorbs the glass plate of one side of multiple glass with a sucker etc., and is loaded to a pallet. On the contrary, when picking out multiple glass from a pallet, it adsorbs similarly. The so-called situation of a "cantilever" with the sucker of multiple glass is usually considered to be 5 or less minutes. Moreover, the atmospheric temperature of the outdoors of summer rises at about 40 degrees C. Therefore, in order not to cause a plate gap during an activity, it is desirable that creep compliance J is below 1x10⁻⁵cm² / dyne [after [of measurement initiation] 40 degrees C, shearing mode, and 5 minutes].

[0031] Moreover, if creep compliance J is smaller than 1x10⁻¹⁰ cm² / dyne [after [of measurement initiation] 40 degrees C, shearing mode, and 5 minutes], in order to hardly carry out a creep on parenchyma, the stress applied between a glass plate and a spacer becomes large, and troubles, such as exfoliation and a glass crack, occur. Therefore, as for J [40 degrees C, shearing mode, and 5 minutes after measurement initiation], it is desirable that they are more

than $1 \times 10^{-10} \text{ cm}^2 / \text{dyne}$.

[0032] As mentioned above, the thickness of the hollow layer of multiple glass has many about 4-18mm things. Therefore, comparatively, even if the creep compliance J [40 degrees C, shearing mode, and 5 minutes after measurement initiation] is below $1 \times 10^{-5} \text{ cm}^2 / \text{dyne}$, when, and creep compliance J has the thick thickness of a hollow layer, it may cause a plate gap. For example, even if a plate gap does not arise in that whose hollow layer creep compliance J is 6mm when large, a plate gap may arise in a 12mm thing. Then, even if the thickness of a hollow layer is 12mm, it can avoid producing a plate gap by making creep compliance J into below $1 \times 10^{-6} \text{ cm}^2 / \text{dyne}$.

[0033] Moreover, especially the thing for which the minimum of creep compliance J is set to $1 \times 10^{-9} \text{ cm}^2 / \text{dyne}$ is desirable. This is the value of $1 \times 10^{-10} \text{ cm}^2 / \text{dyne}$, for example, is JIS. In the durability test specified by R3209, in the multiple glass using a glass plate with a thickness of 5mm, even if a glass plate does not break, a glass plate may break with the multiple glass using a glass plate with a thickness of 3mm. For this reason, it is desirable that the minimums of the creep compliance J [40 degrees C, shearing mode, and 5 minutes after measurement initiation] are especially $1 \times 10^{-9} \text{ cm}^2 / \text{dyne}$ so that the crack of a glass plate may not occur in the glass plate of various thickness.

[0034] It is JIS as a resin constituent used for the spacer in this invention putting the above together. Especially the thing for which 40-75, and the creep compliance J [40 degrees C, shearing mode, and 5 minutes after measurement initiation] use the thing of the range of $1 \times 10^{-6} - 1 \times 10^{-9} \text{ cm}^2 / \text{dyne}$ is desirable. [degree of hardness / A]

[0035] moreover, the steam transmission coefficient as the whole resin constituent -- 5000 -- in order to maintain the dew-point engine performance further below $10^{-13} \text{ cm}^3, \text{ cm}^2, \text{ and sec-Pa}$ -- a steam transmission coefficient -- 500 -- it is desirable to carry out to below $10^{-13} \text{ cm}^3, \text{ cm}^2, \text{ and sec-Pa}$.

[0036] Above JIS Although the below-mentioned example explains the example of the resin constituent for spacers of having A degree of hardness, creep compliance J, and a steam transmission coefficient, the combination component of a desirable resin constituent and its blending ratio of coal are as follows.

[0037]

The rubber in which thermofusion shaping is possible, or elastomer ... 10 - 80 % of the weight
The above-mentioned rubber or thermoplastics other than an elastomer ... 0 - 50 % of the weight
Tackifier ... 0 - 15 % of the weight
A desiccating agent and additives (carbon black, talc, etc.) ... 10 - 60 % of the weight.

[0038] The following which used butyl system rubber for the rubber or the elastomer in which thermofusion shaping is possible as a resin constituent for spacers which can be used still more suitably, and used crystalline polyolefine for thermoplastics other than this rubber or an elastomer are raised.

[0039] In addition, the vocabulary "an additive" which an additive here points out hydrolysis nature silyl radical content compounds, such as lubricant, a pigment, an antistatic agent, a tackifier, a plasticizer, an antioxidant, a thermostabilizer, an antioxidant, and a silane coupling agent, the filler containing an inorganic filler, etc., and is used by others means what added the tackifier except for the inorganic filler from the additive.

[0040] The resin constituent whose rate of 50 - 98 % of the weight and crystalline polyolefine the rate of butyl system rubber of as opposed to both total quantity including butyl system rubber and crystalline polyolefine is 2 - 50 % of the weight.

[0041] The resin constituent whose rates of the inorganic filler to a total of 100 weight sections of butyl system rubber and crystalline polyolefine the rate of 50 - 98 % of the weight and crystalline polyolefine is [the rate of butyl system rubber of as opposed to the total quantity of butyl system rubber and crystalline polyolefine including butyl system rubber, crystalline polyolefine, and an inorganic filler] 2 - 50 % of the weight, and are below the 200 weight sections.

[0042] The above-mentioned butyl system rubber means the copolymers with a homopolymer or other monomers and those denaturation objects of an isobutylene. The copolymer (what is

usually called isobutylene isoprene rubber) obtained by copolymerizing with comparatively a small amount of isoprene as a copolymer is desirable. Halogenation isobutylene isoprene rubber, partial bridge formation isobutylene isoprene rubber, etc. are one of denaturation objects. Especially desirable butyl system rubber is the copolymer of the isobutylene and isoprene which are usually called isobutylene isoprene rubber, and partial bridge formation isobutylene isoprene rubber.

[0043] Crystalline polyolefine is the copolymers with a homopolymer or other monomers and those denaturation objects of olefins, such as ethylene and a propylene, and says what has crystallinity. Other structures may be included although it is desirable that they are syndiotactic structure and isotactic structure as for the structure of a polymer. Especially as an olefin, ethylene and a propylene are desirable.

[0044] As a copolymer, there are a copolymer of two or more sorts of olefins and a copolymer of an olefin and other monomers, and the copolymer of ethylene, a propylene, and other monomers that do not check crystallinity is suitable. Moreover, as a copolymer, a block copolymer is more suitable than an alternating copolymer and a random copolymer. There is crystalline polyolefine which introduced functional groups, such as an acid-anhydride radical, a carboxyl group, and an epoxy group, as a denaturation object.

[0045] The above-mentioned crystalline polyolefine is the polyethylene and polypropylene which are a substantial homopolymer. For example, low density polyethylene, medium density polyethylene, high density polyethylene, etc. can be used as polyethylene. 30% or more of the degree of crystallinity of crystalline polyolefine is desirable, and is desirable. [especially 50% or more of] For example, the value of the typical crystallinity in the usual crystalline polyolefine is 55 - 65% with polypropylene 75 to 90% in high density polyethylene 50 to 60% at low density polyethylene. Although especially molecular weight is not limited, with polyethylene, the thing of about 100,000-400,000 is suitable in about 200,000-800,000 and polypropylene at number average molecular weight.

[0046] Thus, since polyethylene and polypropylene have high crystallinity, they are low moisture permeation from butyl system rubber. As compared with a butyl system rubber independent case, the melt viscosity of a constituent falls and fabrication nature of what shows lower melt viscosity especially improves. Therefore, combination of various inorganic fillers is attained again, and the resin constituent for spacers of a high degree of hardness is realized, and these are desirable also especially from a viewpoint of economical efficiency.

[0047] In the above-mentioned resin constituent, the rate of crystalline polyolefine to the total quantity of butyl system rubber and crystalline polyolefine is 2 - 50 % of the weight, and is 5 - 40 % of the weight preferably. If a raise in the degree of hardness of butyl system rubber is difficult for the rate of crystalline polyolefine and it exceeds 50 % of the weight at less than 2 % of the weight, the property of crystalline polyolefine will serve as a subject and it will be hard coming to be discovered of the property of butyl system rubber.

[0048] When an inorganic filler is blended, there are few rates of crystalline polyolefine to the total quantity of butyl system rubber and crystalline polyolefine, and they end. For example, when the inorganic filler more than the about 50 weight section is blended to a total of 100 weight sections of butyl system rubber and crystalline polyolefine, as for the rate of crystalline polyolefine to the total quantity of butyl system rubber and crystalline polyolefine, the target effectiveness is enough demonstrated at 2 - 20 % of the weight.

[0049] Thus, the inorganic filler of an effective dose can be substantially blended with the above-mentioned resin constituent containing butyl system rubber and crystalline polyolefine. An effective dose means more than 1 weight section to a total of 100 weight sections of butyl system rubber and crystalline polyolefine substantially. Since the melt viscosity of a constituent goes up and, as for blending too much a lot of inorganic fillers, tensile strength and tear reinforcement fall, the upper limits of loadings are the 200 weight sections, and are the 150 weight sections preferably. The minimums with the desirable loadings in inorganic filler combination are 10 weight sections.

[0050] As an inorganic filler, it is independent, or they can use what is usually used as an inorganic filler for a calcium carbonate, talc, a mica, two or more sorts of carbon black, etc., using together.

[0051] Before such a resin constituent is used for an application final at least, it is very effective that the butyl system rubber contained in it and crystalline polyolefine are mixed under an elevated temperature. The elevated temperature in this mixing means the temperature beyond the crystalline melting point of crystalline polyolefine. This mixed temperature needs to be below the decomposition point of butyl system rubber, and is desirable. [of about 300 degrees C or less which is the decomposition point of usual butyl system rubber] 200 degrees C or less are especially desirable from fields, such as productivity. Therefore, the crystalline melting point of crystalline polyolefine also has desirable 200 degrees C or less again.

[0052] As for the resin ingredient for spacers, in the operating temperature limits, it is more desirable that there is as much as possible little degree-of-hardness change. In order to satisfy such requirements, as crystalline polyolefine, what has a crystalline melting point beyond anticipated-use upper limit temperature is desirable. The anticipated-use upper limit temperature of the resin ingredient for building materials is about 80 degrees C.

[0053] By restraining crystalline polyolefine by the cohesive force by the crystal phase, the rapid degree-of-hardness fall or flow condition which are looked at by the non-crystalline polymer also in the temperature field beyond glass transition temperature do not happen below by the crystalline melting point. On the contrary, the remarkable fall of melt viscosity is seen bordering on a crystalline melting point, and the effectiveness of making kneading nature with butyl system rubber becoming good can be expected.

[0054] The drying agent and the above-mentioned additive in which it is generally blended with the resin ingredient for spacers, and deals can be blended with such a resin constituent. When using especially this resin constituent for a spacer, combination of drying agents, such as a zeolite, silica gel, and an alumina, a tackifier, a plasticizer, a silane coupling agent, and various stabilizers is desirable.

[0055] It is desirable to blend especially drying agents, such as a zeolite, five to 30% of the weight into a resin constituent. Moreover, in order to give the adhesion grant effectiveness and the plasticization effectiveness, it is also desirable to carry out 5-150 weight section addition of the polyisobutylene especially below the 200 weight sections to the butyl system rubber 100 weight sections other than a polyisobutylene.

[0056] Especially the desirable component blending ratio of coal of the resin constituent for spacers is 30 - 55 % of the weight of butyl system rubber, 1 - 8 % of the weight of crystalline polyolefines, 15 - 30 % of the weight of inorganic fillers, a desiccating agent, and 20 - 40 % of the weight of additives putting the above together (of course, the rate of butyl system rubber of as opposed to the total quantity of butyl system rubber and crystalline polyolefine in this case is [the rate of crystalline polyolefine] 2 - 50 % of the weight 50 to 98% of the weight).

[0057] As for these resin constituents, it is desirable to mix butyl system rubber and crystalline polyolefine at the temperature below the decomposition point of butyl system rubber beyond the crystalline melting point of crystalline polyolefine at least as mentioned above, and to be manufactured. Especially this mixed temperature has desirable 120-250 degree-C** 100-280 degrees C. You may mix to coincidence and other compounds and additives may be mixed before the mixing or to the back.

[0058] The constituent in this invention is a thermoplastic constituent substantially, and can be mixed with mixers, such as the usual melting mixing extruder and a kneader. Furthermore, it can also fabricate continuously with the above-mentioned mixed actuation. Moreover, a constituent can be manufactured, it can consider as molding materials, such as a pellet type, and the postforming can also be performed. As a fabricating method, the melting fabricating methods, such as an extrusion-molding method and an injection-molding method, can be used.

[0059] Moreover, it arranges at the edge of the multiple glass ingredient with which opposite arrangement of the glass plate of two or more sheets was continuously carried out in the moldings with shaping actuation, and multiple glass can be manufactured. In this case, by using the hot constituent which came out of the making machine, a high adhesive property with a glass plate is acquired. Moreover, it is also applicable to a multiple glass ingredient, controlling the temperature fall of a constituent using equipments, such as an applicator. What can be heated as this equipment is desirable.

[0060] Although **not** limited to the above-mentioned combination component and a ratio, it sets to this invention **by** the above-mentioned blending ratio of coal, and the resin constituent for spacers in this invention is desirable JIS. The spacer which has A degree of hardness and a steam transmission coefficient is obtained.

[0061] Like heat **reflective** glass and low reflection factor glass, the glass plates used for the configuration of **the** multiple glass of this invention are glass plates, such as an aperture currently used **widely** and a door, tempered glass, a glass laminate, metal wired glass, heat absorbing glass, **the** glass plate that coated the front face with a metal or other inorganic substances **thinly**, the acrylic resin plate called organic glass, a polycarbonate plate, etc., and are not usually further limited especially to building materials, a car, etc. Moreover, multiple glass may consist of glass plates of two sheets, and may consist of glass plates of three or more sheets.

[0062] The multiple glass of this invention can apply the adhesives which dissolved in the solvent to the glass side **where** a spacer contacts if needed. And after air-drying adhesives, as shown in drawing 2 R 2, it is predetermined spacing (for example, 6mm) about the glass plates 1a and 1b of two sheets. Extruding using the general-purpose extruder which has the cylinder of a suitable diameter as held to 12mm, next shown in drawing 3 from the die which is made to carry out melting of the above-mentioned resin constituent at the temperature of 150-200 degrees C, and has a suitable tip configuration It is formed by making it intervene between the glass plates of two sheets, and **cooling**.

[0063] The approach of this double stratification is an example, and the manufacture approach of the multiple glass of this invention itself is not limited to the above-mentioned approach, for example, it fabricates the spacer of a request configuration beforehand from said resin constituent, with the glass plate of two sheets, it may carry out thermocompression bonding of this, and may form it.

[0064]

[Example] Next, although an example and the example of a comparison are given and this invention is explained still more concretely, this invention is not limited to these examples.

[0065] The component except a drying agent is kneaded in the constituent shown in the example >> [example 1 of presentation] table 1 of the resin constituent for << spacers, and it is JIS. Add the drying agent which consists of 4A mold desiccation zeolite powder after A degree of hardness obtains the resin constituent of 65, knead further, homogeneity is made to distribute a drying agent, and it is JIS. A degree of hardness obtained the resin constituent for spacers of 85.

[0066] In the same procedure as the example 1 of the [examples 2-14 of presentation] presentation, the resin constituent for spacers whose JISA degree of hardness after zeolite mixing is the value shown in Table 2 was obtained by the combination shown in Table 1.

[0067] In addition, it sets to these tables and isobutylene isoprene rubber is Mooney viscosity 47. The isobutylene isoprene rubber and partial bridge formation isobutylene isoprene rubber which are ML(1+8) 100degree C are Mooney viscosity 45. The partial bridge formation isobutylene isoprene rubber which is ML(1+3) 121degree C, and PIB-A are the polyisobutylene of viscosity average molecular weight 12000, and high density polyethylene the polyisobutylene of viscosity average molecular weight 72000 and whose HDPE of PIB-B are a melt index 20, 130 degrees C of crystalline melting points, and 80% of crystallinity. Moreover, JIS A degree of hardness is JIS. It measured according to K6301. The numeric value of a presentation of an ingredient expresses weight %.

[0068] The example which produced multiple glass using example [of << multiple glass] >>, next the resin constituent for spacers of the above-mentioned examples 1-14 of a presentation is shown. The following examples 1-9 are examples, and Examples 10-14 are examples of a comparison.

[0069] [Example 1] Spacing of 6mm or 12mm was maintained using the extruder for rubber which has a cylinder with a diameter of 40mm for the resin constituent for spacers of the example 1 of a presentation between 3mm in the size of 320x500mm which carried out priming of the spacer contact section beforehand, and thickness, and two 5mm float glass plates, extrusion molding of

the spacer was carried out to the periphery section of a glass plate, and the multiple glass of this invention was obtained.

[0070] In the same procedure as the example 1 of [Examples 2-14], others obtained multiple glass like Example 1 using the resin constituent for spacers of the examples 2-14 of a presentation.

[0071] [The evaluation approach]

Plate [-proof] gap trial: The glass plate of one side of each obtained multiple glass was fixed, the 13kg load was applied to the glass plate of another side, and the downward movement magnitude of the glass plate by the side of a load-ed was measured on 25-degree C temperature conditions. The movement magnitude considered as success what is 0.5mm or less in 20 minutes.

Acceleration durability test: JIS According to R3209, the multiple glass which has a spacer with a thickness of 6mm was followed.

Dew-point measurement: JIS According to the equipment and the approach of a publication, it measured to R3209.

[0072] These measurement results are shown in Table 2.

[0073]

[Table 1]

| | ブチル系ゴム | | | | HDPE | 無機フィラー | | 添加物 | |
|--------|-----------|---------------|-----------|-----------|------|--------|--------------|-----------|-----------|
| | ブチル ゴム | 部分架橋 ブチルゴム | PIB -A | PIB -B | | タルク | カーボン ブラック | 粘着 付与剤 | ゼオ ライト |
| 組成例 1 | | 28.7 | | | 28.7 | 10.6 | 10.6 | | 21.4 |
| 組成例 2 | | 35.2 | 5.3 | | 11.7 | 10.6 | 10.6 | 5.3 | 21.3 |
| 組成例 3 | | 19.1 | 25.6 | | 2.1 | 10.6 | 10.6 | 10.6 | 21.4 |
| 組成例 4 | | 17.0 | 25.6 | | 4.2 | 10.6 | 10.6 | 10.6 | 21.4 |
| 組成例 5 | | | 21.3 | 21.3 | 4.2 | 10.6 | 10.6 | 10.6 | 21.4 |
| 組成例 6 | 42.6 | | | | 4.2 | 10.6 | 10.6 | 10.6 | 21.4 |
| 組成例 7 | | 14.8 | 25.6 | | 6.4 | 10.6 | 10.6 | 10.6 | 21.4 |
| 組成例 8 | | 21.3 | 4.2 | | 21.3 | 10.6 | 10.6 | 10.6 | 21.4 |
| 組成例 9 | | 46.8 | | | | 10.6 | 10.6 | 10.6 | 21.4 |
| 組成例 10 | | 11.5 | | | 46.0 | 10.6 | 10.6 | | 21.3 |
| 組成例 11 | | 5.6 | | | 51.8 | 10.6 | 10.6 | | 21.3 |
| 組成例 12 | | 21.3 | 25.6 | | | 10.6 | 10.6 | 10.6 | 21.4 |
| 組成例 13 | | 8.6 | 4.2 | | 34.0 | 10.6 | 10.6 | 10.6 | 21.3 |
| 組成例 14 | 12.5 | | 15.6 | | 18.7 | 10.6 | 10.6 | 10.6 | 21.4 |

[0074]

[Table 2]

| | スペーサ物性 | | 複層ガラス評価項目 | | | | | | | |
|------|--------|---------------------|-----------|-----|-----|-----|----|----|----|----|
| | 硬度 | J | A | B | C | D | E | F | G | H |
| 例 1 | 85 | — | a | a | a | a | 合格 | 0 | 0 | なし |
| 例 2 | 80 | — | a | a | a | a | 合格 | 0 | 0 | なし |
| 例 3 | 40 | 1×10^{-6} | a | a | a | a | 合格 | 0 | 0 | なし |
| 例 4 | 60 | 5×10^{-7} | a | a | a | a | 合格 | 0 | 0 | なし |
| 例 5 | 65 | 1×10^{-7} | a | a | a | a | 合格 | 0 | 0 | なし |
| 例 6 | 65 | 1×10^{-7} | a | a | a | a | 合格 | 0 | 0 | なし |
| 例 7 | 70 | 2×10^{-8} | a | a | a | a | 合格 | 0 | 0 | なし |
| 例 8 | 90 | 1×10^{-9} | a | -55 | -54 | -40 | 合格 | 0 | 4 | なし |
| 例 9 | 10 | 1×10^{-6} | a | a | a | a | 合格 | 0 | 0 | c |
| 例 10 | 95 | — | a | a | a | 中止 | b | 0 | 4 | なし |
| 例 11 | 95 | — | a | a | a | 中止 | b | 11 | 19 | なし |
| 例 12 | 0 | 5×10^{-4} | a | a | a | a | 合格 | 0 | 0 | あり |
| 例 13 | 95 | 1×10^{-10} | -60 | 10 | 中止 | 中止 | b | 9 | 14 | なし |
| 例 14 | 92 | 1×10^{-10} | -60 | 5 | 中止 | 中止 | b | 9 | 11 | なし |

[0075] Front Naka, evaluation-criteria A-H, and evaluation result a-c mean a degree, respectively.

[0076]

A: An initial dew-point (what has a dew-point high [6 *****]), B:JIS After [R3209 acceleration durability test 1 termination] dew-point (degree C), C:JIS An after [R3209 acceleration durability test 2 termination] dew-point (degree C), D:JIS After [R3209 acceleration durability test 3 termination] dew-point (degree C), E:JIS3 judging, F : The glass crack of the multiple glass of the thickness under durability test (5mm / 6mm / 5mm: a glass plate / hollow layer / glass plate) (100 inside of the body), G: The glass crack (100 inside of the body) of the multiple glass of the thickness under durability test (3mm / 6mm / 3mm: a glass plate / hollow layer / glass plate), H:plate gap, -60 degrees C or less of a:dew-points, b : Since the spacer is hard, As for a glass crack, the thickness of 12mm of generating and c:hollow layer is those with a plate gap, and 6mm has no plate gap.

[0077] From the result of Table 2, while being able to reduce the glass crack of multiple glass by setting the degree of hardness of a spacer to 10-90, a plate gap etc. can be prevented. In this case, in a spacer, only with the above-mentioned resin constituent, there is no rise of a dew-point and the multiple glass with which the configuration of multiple glass was held is obtained.

[0078] On the other hand, when the glass plate whose thickness is 6mm is used for the multiple glass of Example 8, there is no generating of a glass crack, but when a glass plate with a thickness of 3mm is used, a glass crack is seen a little. Moreover, when the thickness of a hollow layer is 6mm, a plate gap does not generate the multiple glass of Example 9, but when the thickness of a hollow layer is 12mm, a plate gap may occur.

[0079] It is JIS as a degree of hardness of the resin constituent for the spacers from this. It turns out that especially the A degrees of hardness 40-75 are desirable. Furthermore, it turns out that 1×10^{-10} to 1×10^{-5} is desirable, and 1×10^{-9} to 1×10^{-6} is especially desirable as a value of the creep compliance J of the resin constituent for spacers.

[0080]

[Effect of the Invention] According to this invention, the activities filled up with two-stage-sealing material are reduced, care-of-health time amount is unnecessary, the routing counter at the time of multiple glass manufacture can be reduced sharply, and multiple glass is offered by high productivity and high low cost.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The partial outline sectional view showing an example of the configuration of the multiple glass of this invention

[Drawing 2] The partial outline sectional view showing the configuration of multiple glass before double-stratifying using the spacer which consists of a thermoplastics constituent

[Drawing 3] The schematic diagram of the extruder used for melting of a thermoplastics constituent in this invention

[Drawing 4] The sectional view showing an example of the configuration of conventional multiple glass

[Drawing 5] The sectional view showing an example of the configuration of conventional multiple glass

[Drawing 6] The outline sectional view explaining an example of the approach of measuring creep compliance J

[Description of Notations]

10: Multiple glass

1a, 1b: Glass plate

20: Spacer

30: Hollow layer

[Translation done.]

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(54) 発明の名称 複層ガラス

(57) 要約

【課題】 複層ガラスのこれまでにない高い生産性を実現し、複層ガラスをより安価にかつ簡便に提供すること。

【解決手段】 スペース20が、25℃においてJIS A硬度が10以上90以下の熱可塑性樹脂からなる複層ガラス10。

図1は、複層ガラス10の断面図を示す。ガラス板1aとガラス板1bは、それぞれ厚さ30のガラス板である。ガラス板1aとガラス板1bの間には、厚さ20のスペース20が設けられている。ガラス板1aとガラス板1bは、それぞれ厚さ30のガラス板である。ガラス板1aとガラス板1bの間には、厚さ20のスペース20が設けられている。

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ラスを製造する方法が提案されている（特公昭61-20501）。しかし、このスベサ用樹脂はスベサとして硬度が不足し、充填には上記樹脂からなるスベサ単独では樹脂ガラスとしての形状の保持が困難であった。

（0008）また、押出成形可能な硬質樹脂、例えば、塩化ビニル樹脂やポリアクリル樹脂などの熱可塑性樹脂に充填剤を混入し、JIS A硬度95の硬さを有する材料をスベサとして用いる樹脂ガラスが知られている（特開7-17748）。しかし、このJIS A硬度95の硬さを有する材料を、樹脂ガラスのスベサまたはガラス板として用いた場合には、樹脂ガラスのシール部またはガラス板にかかる応力が大きくなり、シールの剥離や樹脂ガラス自体のガラス割れが生じるなどの欠点がある。したがって現状では、二次シール材を用いる樹脂ガラスとして要求されるスベサのみで済まずに、形状維持性、成形性などの特性を全て満足する樹脂ガラスは知られていない。

（0009）ところで、特開7-17748にもボルトメルトプロセスの例示があるように、ブチル系ゴムはその粘着性、高弾性および低透過性という面から密封材に適ったシール材として用いられている。しかし、硬度が低くコールドフロー性があるため、使用用途によっては長期耐久性の面で単独では問題がある。また、密封剤が漏れたために、作業性が悪いという問題もある。硬度を向上させるために各種フィラーを混合する方法もあるが、フィラーの添加のみによって高弾性を失うと、密封性能が低下し、引張り強度や引き裂き強度が低下するため望ましくない。

（0010）すなわち、ブチル系ゴムはガラス板とスベサとの間の面をシールし、気密性を維持する機能を有することから、樹脂ガラスの端部シール材として好適に用いることができる。この場合、ブチル系ゴムの硬度が低いことより通常はアルミニウム膜などの金属製のスベサが用いられ、スベサとガラス板との間にブチル系ゴムがシール材として配置されることになる。しかし、前述のように金属製スベサを用いる必要は樹脂ガラス

の製造工程が複雑化する。

（0011）こうして、金属製スベサを必要とせず、製造工程をより簡便化するシール材の開発が望まれている。現状では、二次シールを用いる、樹脂ガラスとして要求されるスベサのみで済み、形状維持性、成形性などの特性を全て満足する樹脂ガラスは知られていない。

（0012）本発明の目的は、製造後の長時間を要する養生の問題を解消し、これまでになく高い生産性を実現できる樹脂ガラスを提供することにある。

（0013）

（製造を解決するための手段）本発明は、2枚以上のガ

ラス板が、その間に中空層を形成するようにスベサを介して糊合されて対向配置された樹脂ガラスにおいて、前記スベサは、25℃においてJIS A硬度が10～90の熱可塑性樹脂組成物からなることを特徴とする樹脂ガラスを提供する。

（0014）

（発明の要旨）以下、図面を参照して本発明をさらに詳細に説明する。図1は、本発明の樹脂ガラスの構成の一例を示す部分断面図であり、樹脂ガラス10は、2枚のガラス板1aおよび1bが、間に中空層30が形成されるようにスベサ200のみによって所定の間に保持される。スベサ20は、JIS A硬度が10～90の熱可塑性樹脂組成物から形成されている。なお、上記の「スベサ200のみによる」という意味は、他に二次シール材や金属製のスベサなどを必要とすることを指すものであり、必要に応じて適用されるブライマー処理を含むものとする。

（0015）本発明の樹脂ガラスの構成においてスベサ材料に用いる熱可塑性樹脂組成物は、25℃においてJIS A硬度が10～90の熱可塑性樹脂組成物である。このようなスベサ用樹脂組成物としては、上記特性を有するかぎり、いずれの熱可塑性樹脂組成物も使用できる。

（0016）なお、近年多方面で使用されている熱可塑性エラストマーや、加硫密度を調節して加熱による溶融流動しうるようにしたゴム系材料も上記の特性を有する。本発明でいう「熱可塑性樹脂組成物」に包含される。さらに、これら熱可塑性樹脂組成物に、ジブチルフラート、ジ-2-エチルヘキシルフラートなどのいわゆる可塑剤を含めた配合物も、上記の特性を有する。本発明でいう「熱可塑性樹脂組成物」に包含される。

（0017）具体的には、本発明で使用する上記樹脂組成物は、熱可塑性樹脂組成物もしくはエラストマーまたは上記のゴムもしくはエラストマー以外の熱可塑性樹脂の少なくとも一方を含むことが好ましく、両者を含むことがより好ましい。また、上記樹脂組成物は低透過性のゴム、エラストマー、または熱可塑性樹脂から構成されていることが好ましい。さらに、樹脂ガラスを構成した場合には、樹脂ガラスの中空層への水分の侵入を防ぐために、中空層の底面に熱可塑性樹脂組成物であることが好ましい。

（0018）上記の低透過性で熱可塑性樹脂組成物もしくはエラストマーとしては、その水蒸気透過係数が好ましくは $3000 \times 10^{-10} \text{ cm}^3 \cdot \text{cm} / \text{cm}^2 \cdot \text{s}$ 、 $\text{sec} \cdot \text{Pa}$ 以下のゴムもしくはエラストマーであり、なかでもイソブチレンとイソプレンとを主体とする共重合体からなるブチルゴム、ポリイソブチレン、ハロゲン化ブチルゴムなどのブチル系ゴムが好適である。これらの低透過性で熱可塑性樹脂組成物もしくはエラストマーは、単独または2種以上のブレンドで用いてもよい。

（0019）また、上記のゴムもしくはエラストマー以外の低透過性熱可塑性樹脂としては、例えば、ポリエチレン、ポリプロピレン、塩化ビニリデン、ポリ塩化ビニルなど、これらのポリマーを構成するモノマーの共重合体、またはこれらの変性物が挙げられ、熱可塑性ポリオレフィンが好ましく、特に高密度のポリエチレンが好ましい。これらの熱可塑性樹脂の水蒸気透過係数は $300 \times 10^{-10} \text{ cm}^3 \cdot \text{cm} / \text{cm}^2 \cdot \text{sec} \cdot \text{Pa}$ 以下が好ましく、 $500 \times 10^{-10} \text{ cm}^3 \cdot \text{cm} / \text{cm}^2 \cdot \text{sec} \cdot \text{Pa}$ 以下がさらに好ましい。この熱可塑性樹脂は、特にスベサの形状保持性能に寄与する。

（0020）本発明におけるスベサ用樹脂組成物は、上記低透過性で熱可塑性樹脂組成物もしくはエラストマー、このゴムもしくはエラストマー以外の低透過性の熱可塑性樹脂に加え、乾燥剤が配合され、さらに無機フィラーやその他の添加剤が必要に応じて配合される。乾燥剤としては、例えば、ゼオライト、アルミナ、シリカゲルなどのように、従来の樹脂ガラスのスベサやシール材に混合されて使用される乾燥剤がいずれも使用できる。

（0021）このようなスベサ用樹脂組成物は、上記成分を望ましい成分とするが、添加物として粘着付着剤、清剤、顔料、帯電防止剤、老化防止剤、熱安定剤、充填剤、発泡剤などを必要に応じて上記熱可塑性樹脂に配合して使用しうる。

（0022）このスベサ用樹脂組成物は、上記成分を調整して調整される。その調整に際しては、得られる樹脂組成物の25℃におけるJIS A硬度が90以下になるように必要成分を配合することが重要である。90以下とする理由は次のとおりである。

（0023）JIS A硬度が90を超える熱可塑性樹脂組成物を樹脂ガラスのスベサとして用いるとした場合、クリープがほとんど起きないために、JIS R 3209に示された耐久試験を実施した際、高温下で空気の膨張による応力がガラス板とスベサとの接合界面にかかる。このため、接着力が不十分であれば樹脂が生じ、仮に接着力が確保されている場合でもガラスが割れることは高圧をかけることによって、中空層が膨張する応力に耐えるだけの接着力を待たなければならない。高圧をかけることによってガラスの破損が発生し、著しく生産性が低下するため、製造コスト低減を目標とする本発明の目的には沿わない。

（0024）一方、硬度が低すぎると樹脂ガラスの形状維持性に問題が生じるので、樹脂組成物の25℃におけるJIS A硬度が10以上になるように必要成分を配合することが重要である。さらにJIS A硬度が10以上であったとしても硬度が比較的小さい場合、中空層の厚みが薄くなり、破損を引き起こすことがある。

（0025）一般的に、用いられる樹脂ガラスは、その中

中空層の厚みが4～18mm程度である（6mmまたは12mmのものが多い）。したがって、硬度が比較的小さい場合には中空層の厚みが6mmのものでは破損が生じなくとも、12mmのものでは破損が生じてしまうことがある。上記硬度を40以上にすることによって、中空層の厚みが12mmのものであっても破損を生じないようである。このことから、本発明における樹脂ガラスにおいて熱可塑性樹脂スベサのJIS A硬度は40以上が特に好ましい。

（0026）JIS A硬度が90を超える樹脂組成物をスベサとして用いた樹脂ガラスは、ガラス板にかかる応力が大きい。そのため、JIS R 3209で規定されている厚さ5mmおよび厚さ3mmのガラス板を用いたいずれの樹脂ガラスでも、加圧耐久試験中にガラス割れが生じる。

（0027）これに対してJIS A硬度が90の樹脂組成物をスベサとして用いた樹脂ガラスは、厚さ5mmのガラス板を用いた樹脂ガラスでは上記試験でガラス割れは発生しない。一方、厚さ3mmのガラス板を用いた樹脂ガラスは上記試験でガラス割れが発生する可能性がある。したがって、スベサ用樹脂組成物のJIS A硬度の上限は90である。また、JIS A硬度が75である樹脂組成物をスベサとして用いた樹脂ガラスは、厚さ5mmおよび厚さ3mmのガラス板を用いたいずれの樹脂ガラスでも、上記試験ではガラス割れは発生しない。現在一般的に使用されている樹脂ガラスのガラス板は厚さが3mmのものである。スベサ用樹脂組成物のJIS A硬度は40～75の範囲がより好適である。

（0028）ところで、JIS A硬度による規定が明瞭なものであることに、クリープ特性を示すクリープコンプライアンスJは、線形弾性率が加わる場合の樹脂の特性を示すもので、弾性率の逆数であるものである。このクリープコンプライアンスJは、例えば次のように測定される。

（0029）図6は、クリープコンプライアンスJの測定方法を示す部分断面図である。測定されるべき樹脂材料60は、ガラス板61a、61bに接合される面の大きさが $10 \times 50 \text{ (mm)}$ で、厚み12mmに成形されている。そして、樹脂材料に $0.2 \text{ kg} / \text{cm}^2$ の応力が加わるように、40℃の雰囲気温度中でガラス板を図の矢印の方向に引っ張り、5分後の材料の伸び ΔL を、クリープコンプライアンスJを計算する。なお、Jの値はガラス板61a、61bの厚みに依存しないが、ここでは厚み5mmのガラス板を用いることとする。

（0030）例えば、樹脂ガラスは、その作製後の型において、樹脂ガラスの片側のガラス板を吸着等で吸着し、バレットへ積み込まれる。逆に、樹脂ガラスをバレットから取り出すときも同様に吸着される。樹脂ガラスの破損によるいわゆる「片持ち」の状況は通常5分以下

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m: ガラス板/中空層/ガラス板) の複層ガラスのガラス割れ (100体中)。

G: 耐久試験中における厚み (3mm/6mm/3mm)

m: ガラス板/中空層/ガラス板) の複層ガラスのガラス割れ (100体中)。

H: 板ずれ。

a: 露点-60℃以下。

b: スペースが硬いため、ガラス割れが発生。

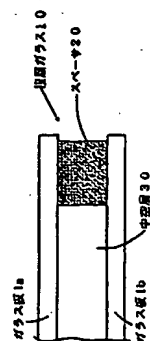
c: 中空層の厚み 12mmは板ずれあり、6mmは板ずれなし。

[0077] 表2の結果より、スペースの硬度を10~90にすることによって、複層ガラスのガラス割れを低減できるとともに、板ずれ等を防止できる。この場合、スペースを上記の樹脂組成物のみで、露点の上昇がなく、複層ガラスの形状が保持された複層ガラスが得られる。

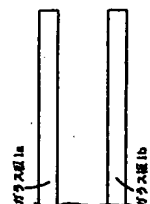
[0078] 一方、例8の複層ガラスは、厚みが6mmのガラス板を用いた場合にはガラス割れの発生がないが、厚み3mmのガラス板を用いた場合には若干ガラス割れが見られる。また、例9の複層ガラスは、中空層の厚みが6mmの場合には板ずれが発生しないが、中空層の厚みが12mmの場合には板ずれが発生することがある。

[0079] このことから、スペース用の樹脂組成物の硬度として、JIS A硬度40~75が特に好ましい。

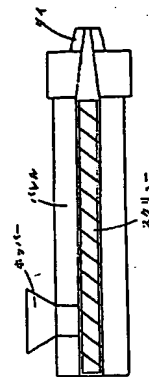
[図1]



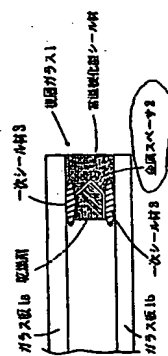
[図2]



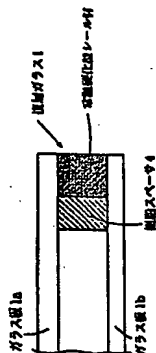
[図3]



[図4]



[図5]

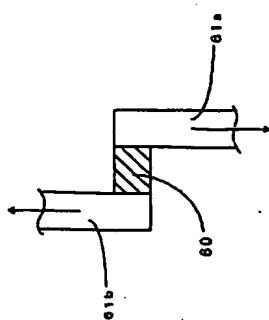


61b

60

61a

[図6]



フロントページの続き

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